REMARKS

The comments of the applicant below are each preceded by related comments of the examiner (in small, bold type).

The "Office Action Summary" indicates that the drawings submitted on July 17, 2003, are not accepted, but the office action does not indicate any reason for this. The previous office action indicated that the same drawings were accepted. The drawings submitted on July 17, 2003, have been replaced by the drawings submitted on April 7, 2004.

1. Claims 1-23, 101-102 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The newly introduced limitation of independent claims 1 and claim 102 have limitation: "calculating from the signals positions of the light at the two or more sensors, each at a resolution that is higher than the resolution of the pixels". It is not clear, what the "resolution of the pixels" means? Is it sensor resolution or what?

Claims 1, 27, and 101 have been amended.

2. Claims 1-18, 22, 27-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa (US Patent No. 6,100,538) in view of Norita et al. (US Patent No. 6,243,16581).

As to claim 1, as best understood by examiner, Ogawa teaches a method (See Col. 1, Lines 7-22) comprising

conveying light from a moving light source on the writing instrument as an indication of a location (See Figs. 1, items 2, 24, Col. 8, Lines 14-18) and path of the writing instrument on a two-dimensional writing surface (See Fig. 1, items 1-2, Col. 4, Lines 18-33),

sensing the light at pixels of each of two or more sensors and generating a sequence of signals representative of the sensed light (See Fig. 1, items 3L-3R, Col. 6, Lines 43-56), and

applying a technique to increase a stability of the positions (See Fig. 1, items 3L-3R, from Col. 6, Line 65 to Col. 7, Line 3).

Ogawa does not disclose calculating from the signals positions of the light at the two or more sensors, each at a resolution that is higher than the resolution of the pixels.

Norita et al. teaches calculating from the signals positions of the light at the two or more sensors, each at a resolution that is higher than the resolution of the pixels (See Fig. 4-5, from Col. 7, Line 56 to Col. 8, Line 34).

It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate Norita et al. teaching into Ogawa system in order to calculate the position of the light with higher resolution (See Col. 8, Lines 26-29 in the Norita et al. reference).

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13. Applicant's arguments with respect to claims 1, 83 have been fully considered but they are not persuasive:

On page 10, last paragraph of Remarks, Applicant's stated that in Ogawa " circuit component ... generates left angular information based on the one-dimensional linear image

> **supplied from the linear image sensor". However, Figure 1 clearly disclose two detecting units: left-hand detecting unit 3L and right detecting unit 3R to compute the positional coordinates of the pointer (See Col. 6, Lines 43-56).**
>
> **On same page, the same paragraph of Remarks, Applicant's stated there is no indication of what resolution the sensor is capable. However, claim 1 does not have the resolution as limitation.**

Claim 1 has been amended. Norita describes "a measuring system for measuring a three-dimensional shape of an object" (col. 1, ll. 12-13) that uses a two-dimensional "area sensor" (col. 1, ll. 49; see col. 7, ll. 19-21: "by repeating the mirror scanning and taking of images 324 times, a distance image consisting of 256x324 points is generated"). In contrast, claim 1 calculates the position of a point light source using "sensors each comprising linear arrays of sensitive pixels." Techniques used to calculate a position with higher resolution than the pixel resolution of a 2D sensor do not necessarily work to calculate such positions "only along linear array[s]" (for example, contrast the calculations in Norita, col. 22, l. 41 – col. 23, l. 25, to those in the present application, p. 44, l. 16 – p. 45, l. 18), thus the disclosure of doing so with a 2D sensor would not serve as any motivation to use such techniques to improve resolution in an application using a linear array.

> **As to claim 27, as best understood by examiner, Ogawa teaches apparatus (See Col. 1, Lines 7-22) comprising a sensor to receive light (See Fig. 1, items 3L-3R, Col. 6, Lines 43-56) from a writing instrument (See Figs. 1, items 2, 24, Col. 8, Lines 14-18) moving across an X-Y writing surface (See Fig. 1, items 1-2, Col. 4, Lines 18-33),**
>
> **in which optics have an instability and are configured to enhance optical power of the light received from the writing instrument (See Figs. 1-2, items 3L-3R, from Col. 6, Line 65 to Col. 7, Line 3).**
>
> **Ogawa does not disclose optics that enable calculation of a position of the light at a resolution that is higher than the resolution of the pixels. Norita et al. teaches optics that enable calculation of a position of the light at a resolution that is higher than the resolution of the pixels (See Fig. 4-5, from Col. 7, Line 56 to Col. 8, Line 34).**
>
> **It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate Norita et al. teaching into Ogawa system in order to calculate the position of the light with higher resolution (See Col. 8, Lines 26-29 in the Norita et al. reference).**

Claim 27 has been amended and is patentable for at least similar reasons as claim 1.

> **5. Claims 83-84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa in view of Stork et al. (US Patent No. 6,181,329 B1).**
>
> **As to claim 83, Ogawa teaches a method comprising locating a writing instrument at a succession of locations on a writing surface (See Fig. 1, items 1-2, Col. 4, Lines 18-33),**

generating signals representative at sensors from light received from writing instruments at the succession of location (See Fig. 1, items 3L-3R, Col. 6, Lines 43-56).

Ogawa does not disclose determining calibration parameters for the writing instrument for use in calibrating a process that determines the locations of the writing instrument as it is being moved on the writing surface.

Stork et al. teaches determining calibration parameters for the writing instrument for use in calibrating a process that determines the locations of the writing instrument as it is being moved on the writing surface (See from Col. 5, Line 54 to Col 6, Line 9).

It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate Stork et al. teaching into Ogawa system in order to use the writing instrument in many different environments (See Col. 1, Lines 31-36 in the Stork et al. reference).

As to claim 84, Stork et al. teaches the calibration parameters comprise coefficients used in polynomial series that are part of the position determining process (See Col. 5, Lines 54-66).

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On page 11, last paragraph and 1st paragraph on page 12 of Remarks, Applicant's stated that amended claim 83 to calibrate a process that determines "the locations of the writing instrument as being moved on the writing surface". However, Stork et al. also calibrating the writing instrument as being moved on the writing surface by putting the sensors in known positions (See Fig. 1, item 190, Col. 5, Lines 57-63).

The applicant disagrees. The "positions" of Stork are not the same as the "locations" claimed. Stork describes orienting the writing instrument in different "known positions with **known acceleration components**" – upright, sideways, etc – relevant to calibrating gyroscopes and accelerometers: "when **one of the accelerometers**, such as the x-axis accelerometer, is **perpendicular to gravity**, then the output of the accelerometer should correspond to -9.81 m/sec^2..." (col. 5, ll. 58-65, emphasis added). The various calibration positions of the writing instrument in Stork are clearly not "locations **on a writing surface**." Stork does not describe and would not have made obvious "locating a writing instrument at a succession of locations on a writing surface." As neither of the references cited contain this element of claim 83, the examiner has failed to state a prima facie case of obviousness. Even if there were motivation to combine Stork with Ogawa, the resulting product would not have the claimed features.

On page 12, 2nd paragraph of Remarks, Applicant's stated that there is no motivation to combine the references and environmental factors not relevant to using light sensors. However, environmental factors like temperature always relevant to determine location on the writing surface to determine the position of the writing instrument (See Fig. 1, item 190, Col. 1, Lines 31-36) and Col. 5. Lines 57-63).

Environmental factors may be relevant to gyroscope- and accelerometer-based sensors as described in Stork, but the applicant does not concede, and the examiner has not presented any evidence, that they are relevant to optical sensors, as claimed. As explained in the specification, the claimed calibration serves to determine the "unambiguous dependency [that] exists between the XY position of a pen and left and right detector (L and R) readings" (p. 19, ll. 3-4) and "to obtain effective values for refractive index and distances between the lenses and sensors" (p. 20, ll. 11-12). In addition, "the particular calibration parameters for a pen are stored in the memory of the pen during production test and calibration" (p. 26, ll. 19-21), so they are clearly not compensating for environmental factors at the point where the pen is used.

The applicant maintains its contention that there would have been no motivation to combine Stork with the other references because calibrating gyroscopes and accelerometers to compensate for variations in the physical environment by orienting a device so that different axes are perpendicular to gravity teaches nothing about calibrating light sensors to compensate for manufacturing variations by placing the light source to be sensed in different locations on a writing surface.

> **7. Claim 101 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa in view of Norita et al. and Behrends (US Patent No. 5,572,607).**
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> **As best understood by examiner, Ogawa teaches a method comprising receiving light from a moving writing instrument (See Fig. 1, item 2) at a light sensor having an array of sensitive pixel elements (See Fig. 1, items 3L-3R, Col. 6, Lines 43-56 and Col. 7, Lines 44-48).**
>
> **Ogawa does not disclose determining a location in the array with a resolution that is higher than the resolution of the pixel elements.**
>
> **Norita et al. teaches determining a location in the array with a resolution that is higher than the resolution of the pixel elements (See Fig. 4-5, from Col. 7, Line 56 to Col. 8, Line 34).**
>
> **It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate Norita et al. teaching into Ogawa system in order to calculate the position of the light with higher resolution (See Col. 8, Lines 26-29 in the Norita et al. reference).**
>
> **Ogawa and Norita et al. do not disclose determining a location in the array at which the maximum intensity of light has been received from the writing instrument.**
>
> **Behrends teaches determining the location in the array at which the maximum intensity of light has been received from the writing instrument (See Fig. 7, item Ik, Col. 7, Lines 44-60).**
>
> **It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate Behrends teaching into Ogawa and Norita et al. system to improve correction of intensity (See Col. 2, Lines 38-44 in the Behrends reference).**

Claim 101 has been amended and is patentable for at least similar reasons as claim 1.

> 9. Claims 24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa in view of Wood et al. (US Patent No. 6,414,673 B1).
>
> As to claim 24, Ogawa teaches a method (See Col. 1, Lines 7-22) comprising conveying light from a moving light source on the writing instrument in a time-changing pattern of directions (See Figs. 1, items 2, 24, Col. 8, Lines 14-18), sensing the light at pixels of each of two or more sensors spaced from a writing instrument (See Fig. 1, items 3L-3R, Col. 6, Lines 43-56).
>
> Ogawa does not disclose determining the location of the writing instrument by detecting a phase difference between signals measured at the two or more sensors.
>
> Wood et al. teaches determining the location of the writing instrument by detecting a phase difference between signals measured at the two or more sensors (See Fig. 14, items 16, 18, 20a-20b, Col. 8, Line 33-55).
>
> It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate Wood et al. teaching into Ogawa system in order to calculate the position of the pen (See Col. 3, Lines 6-25 in the Wood et al. reference).
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> As to claim 25, Wood et al teaches a rotating pattern with respect to an X-Y plane (See Col. 16, Lines 21-32).
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>
> Applicant's arguments, with respect to the rejection(s) of claim(s) 24 using Ogawa reference have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Wood et al.

The applicant disagrees. Ogawa describes a single "light-emitting member 24 such as an LED" and "a light guide member 23 at a tip end for forming a light point or bright spot" (col. 8, ll. 15-17). A light point or bright spot, formed by a single LED and a light guide, does not convey light "in a time-changing pattern of directions." As explained in the specification, a "time-changing pattern of directions" is one generated by, for example, a "rotating light on the pen tip … realized using several (e.g., eight) LEDs 623 that are triggered at times spaced apart by T/N" (p. 58, ll. 7-8).

As for Wood and claim 25, claim 24 has been amended to clarify that the "time-changing pattern of directions" is emitted "from within a moving writing instrument." Wood notes that "the dual signal transmitter pen 30c can be rotated by the user," (col. 16, ll. 31-32), but that does not describe emitting light "in a rotating pattern" "from within a moving writing instrument."

> *Allowable Subject Matter*
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> 11. Claims 21, 23, 33-37 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
>
> Relative to claim 21 the major difference between the teaching of the prior art of record (Ogawa, Norita et al) and the instant invention is that the light conveyed from the light

source includes a strong short pulse imposed on the modulation frequency, and a phase lock loop determines the modulation frequency from the sensor signals, and the sensor signal is sampled at the times triggered by the phase lock loop during the duration of the strong short pulse.

Relative to claim 23 the major difference between the teaching of the prior art of record (Ogawa, Norita et al) and the instant invention is that the conveyed light includes periods of lower frequency modulation and bursts of higher frequency modulation, and the sensor signal associated with the higher frequency bursts is used to lock onto a modulation clock.

Relative to claim 33 the major difference between the teaching of the prior art of record (Ogawa, Norita et al) and the instant invention is that the processes determine the integral power of the overall signal distribution on the sensor and calculate a position of the light at a resolution that is higher than the resolution of the pixels based on half of the integral power position.

Relative to claim 34 the major difference between the teaching of the prior art of record (Ogawa, Norita et al) and the instant invention is that the processes use a polynomial approximation on the signal distribution and calculate a position of the light at a resolution that is higher than the resolution of the pixels as a position of approximated maximum.

Claims 35-37 depend on claim 34.

The applicant acknowledges that claims 21, 23, and 33-37 are patentable.

As to claims 2-3, 10,...
As to claims 4-5, 28-31,...
As to claims 6-7, 11, ...
As to claims 8-9, 32, ...
As to claim 12,...
As to claim 13, ...
As to claim 14,...
As to claim 15, ...
As to claim 16-18, 22, ...
3. Claim 19 is rejected under 35 U.S.C. 103(a)...
4. Claim 20 is rejected under 35 U.S.C. 103(a)...
6. Claim 85 is rejected under 35 U.S.C. 103(a) ...
8. Claim 102 is rejected under 35 U.S.C. 103(a)...
10. Claim 26 is rejected under 35 U.S.C. 103(a) ...

All of the dependent claims are patentable for at least the reasons for which the claims on which they depend are patentable.

Canceled claims, if any, have been canceled without prejudice or disclaimer.

Any circumstance in which the applicant has (a) addressed certain comments of the examiner does not mean that the applicant concedes other comments of the examiner, (b) made arguments for the patentability of some claims does not mean that there are not other good reasons for patentability of those claims and other claims, or (c) amended or canceled a claim does not mean that the applicant concedes any of the examiner's positions with respect to that claim or other claims.

No fees are believed due at this time. Please apply any charges or credits to deposit account 06-1050.

Respectfully submitted,

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